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The Problem of Studying Virus Diseases of Plants

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The purpose of the present paper is to sum up the results of work done in the study of virus diseases of plants, and also to point out routes for further work in this field.

In the first stages of studying virus diseases of plants we come upon the name of the Russian scientist, D. I. Ivanov, on the basis of whose work the Dutch scientist Beiring was able to formulate the famous definition of viruses: "a contagious origin, living and liquid" (contagium vivum fluidum). Notwithstanding the fact that the study of virus diseases dates back to almost half a century, correct systematic study of plant viruses in Russia strengthened and began to be developed only in the last ten years, due chiefly to the work of Prof. B. L. Ryzhkov.

The spread of virus diseases is undoubtedly linked with the geographic location of the plant. For instance, in the north affection of potatoes with virus disease is rather low, approximately 1% ; in the south it increases to 50% and more. The degree of spreading of contagion of the potato differs also according to altitude of the locality above sea level: in proportion to the degree above sea level, disease of the potato decreas-- Thus, in the series of problems confronting scientists, for the question of geographic distribution of virus diseases, locality must be absolutely, and not slightly, determined.

Studying the geographic distribution of virus diseases, we must not forget the exceeding importance of the circumstance with which distribution of disease is linked - ecological conditions. Solution of the question of how many and what ecological conditions influence the ppread of one or [illegible] virus confronts us with very serious difficulties. To establish the connection with modification of ecological conditions of a particular diseases' organism and virus, as for instance, to study how the change of ecological conditions acts upon sick and healthy plants and upon a contagious source -- this is a complicated problem demanding much attention and careful approach.

Upon investigatingthe distribution of virus diseases it becomes clear that not all plants are of equal susceptibility to virus. There is a kind more susceptible to disease; there is the less susceptible. The established presence of natural and acquired immunity merits attention from the theoretical side as well as from the practical. Actually, a selection from among the many kinds of the most stable has great importance in the national economy.

In line with this goes the problem of studying the nature of immunity, which can depend not only on the plant and on ecologic l conditions, making it more susceptible to disease, but also on the state of activity of the virus itself.

To analyze what physiological and ecological (geographic) conditions act strongly on the plant, and what on the contagious origin -- this is a problem demanding keenness of observation

from the scientist and skillful experimentation.

Interesting in connection with this is the case observed when plants infected with a weak form of virus disease acquire immunity; i.e. become increasingly unsusceptible (immune) to second infection, or when localized disease of separated organs of the plant (leaves) produce resistance to further development of the disease, confining its course to localized symptoms. We have not yet ascertained the possibility of producing artificial immunity by methods of vaccination, but work in this direction merits attention, although it demands particular care, since it is linked with the application of infectious material. It should seriously help in solving the question of the nature of immunity, whether acquired or hereditary.

Problems ariging from a study of virus diseases can be resolved, however, only in case we know what represents the "virus": have we to deal with a substance generated in the plant under the influence of specific conditions, a substance which, accumulated in the plant, can materially express itself in the form of particles or some other form, microscopically observed or visible particles accompanying the disease, which appear to be carriers of the unseen organism, live virus, which are combined with these visible material particles.

In the study of the nature of filterable virus very interesting contributions have already been received, connected with the name of Stanley, who succeeded in obtaining an albuminous crystallized preparation, possessing great infectivity. But much has still to be done

in order to clarify the chemical nature of the obtained preparation and reconcile contradictory opinions about it, and, perhaps first of all decide to what extent consideration concerning the crystalline nature of virus is justified.

In connection with the question of the nature of plant virus, investigations of animal viruses acquire particular importance. This makes it possible to draw closer to a solution of the problems of the singular nature of filterable viruses, animal and plant.

Studies are needed observing the specificity of viruses: Do apparently similar viruses actually cause different activity in plants, and to what extent is a definite virus capable of producing disease only in a limited number of plant varieties.

Another problem which arises in proportion to the broadening of our knowledge of viruses and different form of disease produced by them in plants, is their classification, based on the application of different methods: morphological, chemical and even serological. This will not become clear without study of the character of plant diseases caused by virus -- anatomically/ study for investigation of plant tissues, and physiological study emphasizing functional characteristics.

Carriers (aphids, cicadas, etc.) play an important role in the spread of virus diseases. One question to be clarified - when is the carrier most dangerous to the plant - also should have a definite place in proposed works.

Requiring serious attention are the development of methods of prevention of distribution of virus diseases and measures delaying development of disease.

Thus we see that there is still much to be done in order to know the nature of virus, to conduct rational methods of prevention in the spread of virus disease.

Two further questions are linked with study of virus disease in Russia, solution of which have great significance. First of all is this question of organization. At the present time we have a comparatively very small number of scientists who can devote themselves to the study of viruses. The question of increasing the number of workers is basic and must be put before educational institutions of all size.

Together with the question of organization arises another, connected with it. This is the question of creating a center of coordinated work of theoretical character for the study of the nature of viruses of plants and viruses of animals and man. Such a center should be established in connection with the Academy of Science or in connection with some other institution.